|  |  |  |
| --- | --- | --- |
| Breakout #2: Patterning and Algebra, Learning Goals and Consolidating Questions | | Grade 5-8 |
| 75 min | Math Learning Goals   * Explore different representations of patterns and discover that different representations bring about different mathematical concepts. * Experience creating learning goals, success criteria and consolidating questions. | Materials   * BLM 2.1- BLM 2.10 * Chart paper * Markers * Colour tiles * Scissors * ppt |
|  | Groups 🡪 Pattern Cards & Discussions  Distribute a card (to be cut out from BLM 2.1) to each participant and have them form groups of three that go together. | aalstudents are given the opportunity to reflect on their strengths/comfort with various representations  aalstudents will reflect on possible uses of di |
| Minds On… |
| 15 min. |
|  | Groups 🡪 Activity  Complete the table problem, BLM 2.2, in the groups they created in the minds on activity.  Whole Group 🡪 Bansho  Refer to Monograph titled Communication in the Mathematics Classroom.  <http://www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/CBS_Communication_Mathematics.pdf>  Groups🡪 Discussion  In their table groups, have the participants identify the overall expectation, the big idea, and the lesson of the Table Problem on the Posing Powerful Questions (PPQT) template, BLM 2.10  As a table group, have the participants discuss what they, as a teacher, would describe as a good answer. Have a representative from each table group share the success criteria they created. | aalstudents will reflect on which approaches to solving a problem bring about which learning goal  aalreflect on what a makes a good solution and a suitable consolidating question |
| Action! |
| 30 min. |
|  | Groups 🡪Discussion  Have participants examine samples of student work(BLM 2.3, 2.4, and 2.5) and come up with statements/questions which they could use when responding to students in the moment.  To offer another lens on the activity, look at the generalization and justification frameworks. (Handout BLM 2.6, 2.7 to each student)  Discuss the differences between using success criteria vs. the frameworks. | aalstudents will reflect on their own assessment techniques in their classroom (are they focusing on correct solutions or frameworks)l |
| Consolidate Debrief |
| 30 min. |
| Skill Drill  Reflection | Home Activity or Further Classroom Consolidation  Individual 🡪 Handout  Have students complete BLM 2.8 individually. (BLM 2.9 is the answer sheet) | aolto ensure that multiple representations are well understood and consider consolidating questions and learning goals |

**BLM 2.1 Multiple Representation Cards**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Pictorial Representation | Pattern Rule Representation | Graphical Representation |
| A |  | Number of Tiles  = (Position Number) x 6 |  |
| B |  | Number of Tiles  = (Position Number) x 1 |  |
| C |  | Number of Tiles  = (Position Number) x 5 |  |
| D |  | Number of Tiles  = (Position Number) x 4 |  |
| E |  | Number of Tiles  = (Position Number) x 3 |  |
| F |  | Number of Tiles  = (Position Number) x 2 |  |
| G |  | Number of Tiles  = (Position Number) x 5 + 2 |  |
| H |  | Number of Tiles  = (Position Number) x 3 + 4 |  |
| I |  | Number of Tiles  = (Position Number) x 4 + 1 |  |
| J |  | Number of Tiles  = (Position Number) x 2 + 2 |  |

**BLM 2.2 Table and Chairs Problem**

Grenvale Public School has decided to include a lunchroom as part of the school’s renovations. Mrs. Chen, the principal, found an amazing sale on trapezoid shaped tables so she decided to buy many of these tables for the new lunchroom.

While Mrs. Chen was waiting for her order to be delivered she thought she would draw a plan for her lunchroom. Mrs. Chen decided she would place the chairs around the table so that 2 chairs will go on the long side of the trapezoid and one chair on every other side of the table.

This way 5 students can sit around 1 table.

Then she found she could join 2 tables like this:

Now 8 students can sit around 2 tables.

Problems: (answer each of these problems in 2 different ways)

How many students can sit around 3 tables joined this way?

How many students can sit around 56 tables joined this way?

When the tables are joined this way, will the tables ever seat 100 students without any extra seats? How do you know?

**BLM 2.3**

**Sample Solution # 1**

Here is a sample solution to the problem. Decide if this is a good solution. Also, consider how you would respond to the student in the moment if you were watching them do what they were doing.

|  |  |
| --- | --- |
| Tables | Seats |
| 1 | 5 |
| 2 | 8 |
| 3 | 11 |
| 4 | 14 |
| 5 | 17 |
| 6 | 20 |
| 7 | 23 |
| 8 | 26 |
| 9 | 29 |
| 10 | 32 |
| 11 | 35 |
| 12 | 38 |
| 13 | 41 |
| 14 | 44 |
| 15 | 47 |
| 16 | 50 |
| 17 | 53 |
| 18 | 56 |
| 19 | 59 |
| 20 | 62 |
| 21 | 65 |
| 22 | 68 |
| 23 | 71 |
| 24 | 74 |
| 25 | 77 |
| 26 | 80 |
| 27 | 83 |
| 28 | 86 |
| 29 | 89 |
| 30 | 92 |
| 31 | 95 |
| 32 | 98 |
| 33 | 101 |
| 34 | 104 |
| 35 | 107 |
| 36 | 110 |
| 37 | 113 |
| 38 | 116 |
| 39 | 119 |
| 40 | 122 |
| 41 | 125 |
| 42 | 128 |
| Running out of | space… |
| 55 | 167 |
| 56 | 170 |

How many students can sit around 3 tables joined this way?

**11**

How many students can sit around 56 tables joined this way?

**170**

When the tables are joined this way, will the tables

ever seat 100 students without any extra seats? How do you know?

**No, with 32 tables there are 98 seats.**

**With 33 tables there are 101 seats.**

**BLM 2.4**

**Sample Solution # 2**

Here is a sample solution to the problem. Decide if this is a good solution. Also, consider how you would respond to the student in the moment if you were watching them do what they were doing.

How many students can sit around 3 tables joined this way?

**In the picture, 1 table seats 4**

**2 tables seat 8**

**3 tables would seat 12**

How many students can sit around 56 tables joined this way?

**56 x 4 = 224**

**tables seats at each table total # of seats**

When the tables are joined this way, will the tables ever seat 100 students without any extra seats? How do you know?

**Yes, because 25 x 4 = 100.**

**So when there’s 25 tables, there will be 100 seats.**

**BLM 2.5**

**Sample Solution # 3**

Here is a sample solution to the problem. Decide if this is a good solution. Also, consider how you would respond to the student in the moment if you were watching them do what they were doing.

How many students can sit around 3 tables joined this way?

**4 + 3 + 4 = 11**

How many students can sit around 56 tables joined this way?

**56 -2 = 54 x 3 = 162 + 4 + 4 = 170**

When the tables are joined this way, will the tables ever seat 100 students without any extra seats? How do you know?

**25 – 2 = 23 x 3 = 69 + 4 + 4 = 77**

**35 – 2 = 33 x 3 = 99 + 4 + 4 = 108**

**34 – 2 = 32 x 3 = 96 + 4 + 4 = 104**

**33 – 2 = 31 x 3 = 93 + 4 + 4 = 101**

**No, with 32 tables it will be 98 so there will never be 100 seats.**

**BLM 2.6**

**Generalization Strategies**

|  |  |
| --- | --- |
| **Strategy** | **Description** |
| Counting | Drawing a picture or constructing a model to represent the situation to count the desired attributes |
| Recursive | Building on the previous term or terms in the sequence to determine subsequent terms (Additive thinking) |
| Whole-object | Using a portion as a unit to construct a larger unit by multiplying. There may or may not be an appropriate adjustment for over-or-undercounting. |
| Guess-and-check | Guessing a rule without regard to why this rule might work. Usually this involves experimenting with various operations and numbers provided in the problem situation. |
| Contextual | Constructing an explicit rule that expresses the co-variation of two sets of data, based on information provided in the situation. An explicit rule can allow for the prediction of any term number in the pattern. |

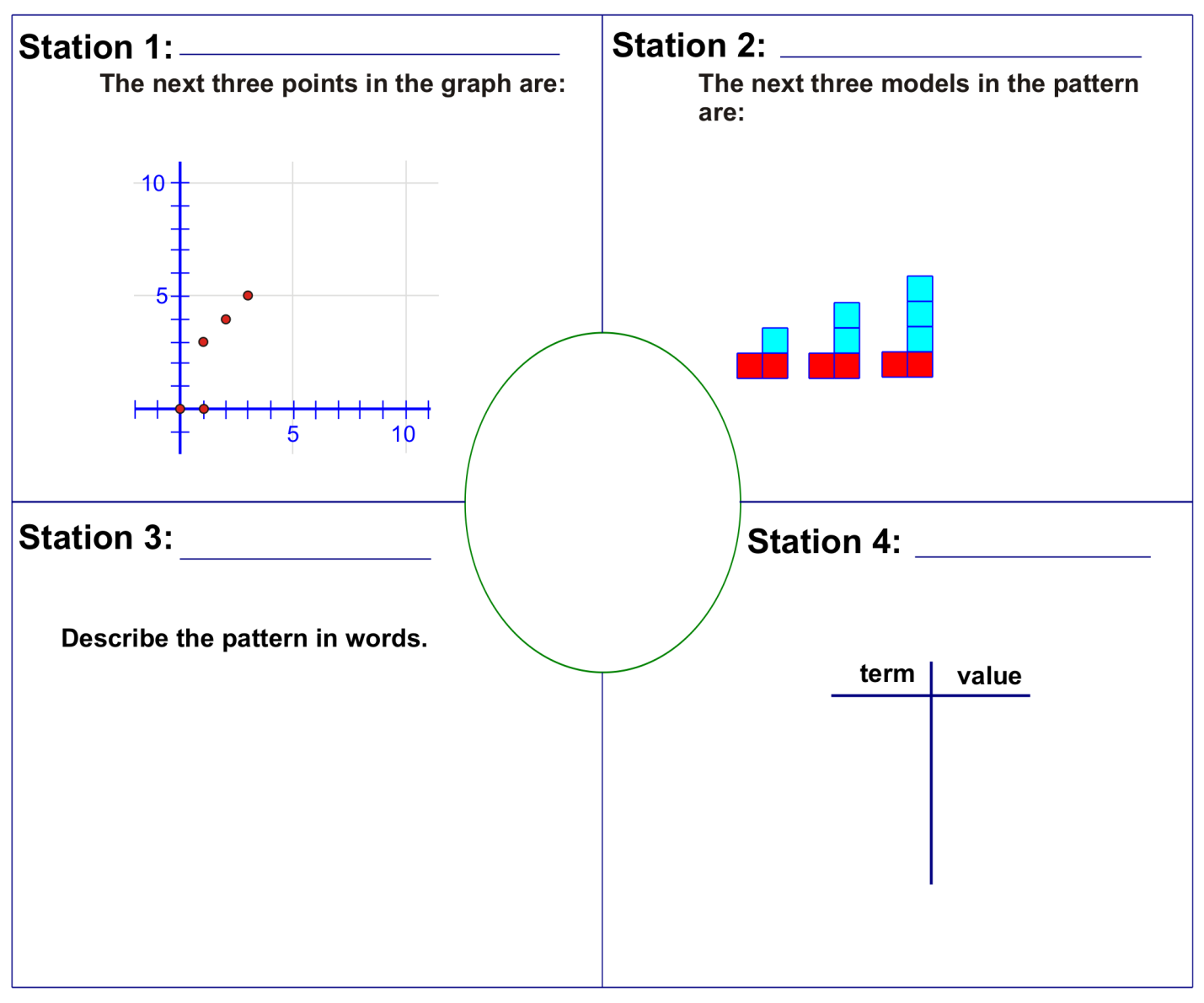
**BLM 2.7**

**Justification Framework**

|  |  |
| --- | --- |
| **Justification Level** | **Description** |
| Level 0: No Justification | Responses do not address justification |
| Level 1: Appeal to external authority | Reference is made to the correctness stated by some other individual or reference material |
| Level 2: Empirical evidence | Justification is provided through the correctness of particular examples |
| Level 3: Generic example | Deductive justification is expressed for a particular instance. |
| Level 4: Deductive justification | Validity is given through a deductive argument that is independent of particular instances |

**BLM 2.8 Multiple Representations**

Complete the following chart individually. Write the general rule in the middle circle.



Complete the following statement.

If I was asked to find…

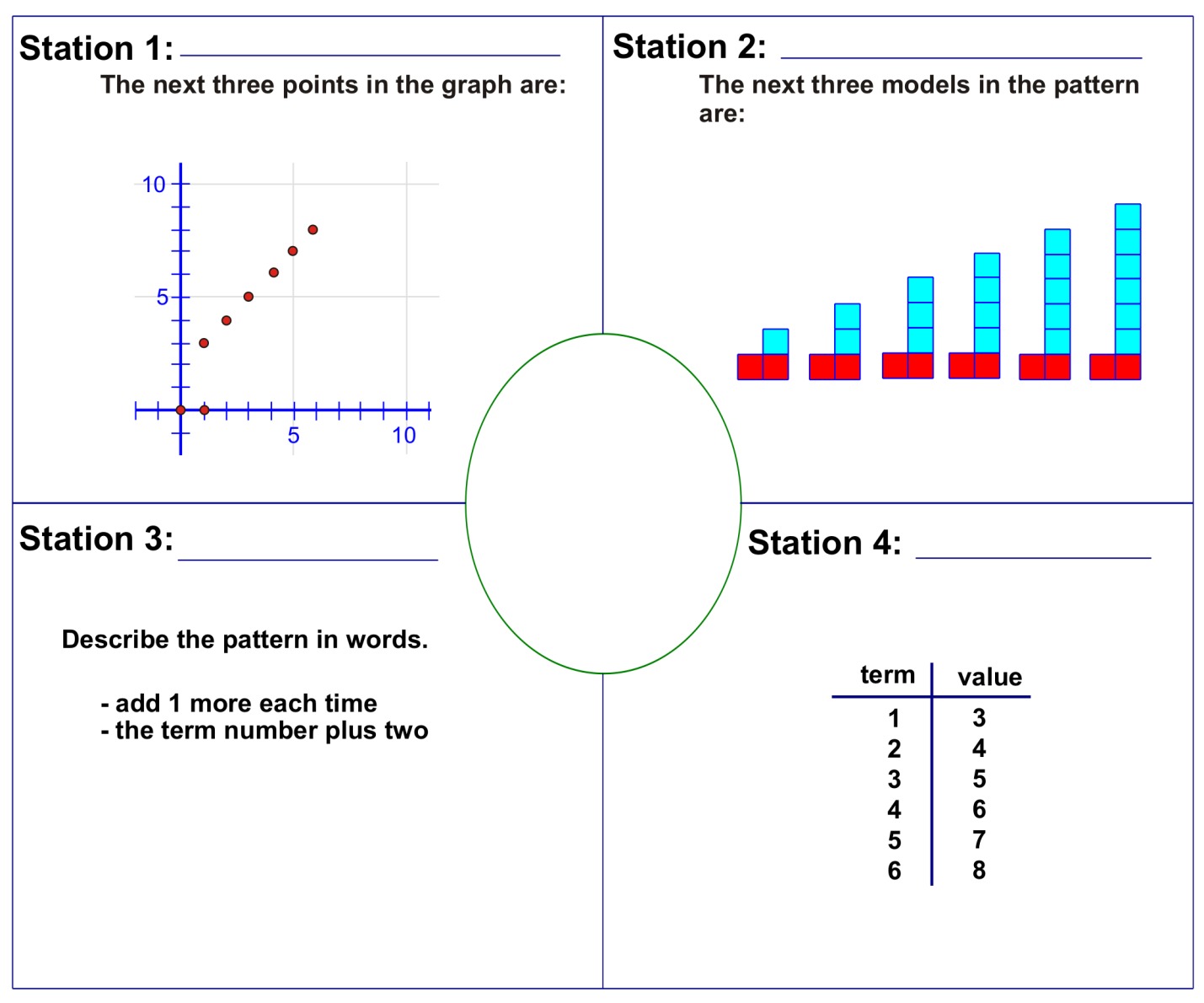
then I would use …

to help me find the answer.

Would this task have been suitable to meet the learning goal your group decided on?

Or, would you have modified it? How?**BLM 2.9 Multiple Representations – Answer Sheet**

Complete the following chart individually. Write the general rule in the middle circle.



# of tiles = position number x 1 + 2

Complete the following statement. Sample Answers

If I was asked to find… **the 100th term**  or **general rule**

then I would use … **the general rule** **concrete (visual)**

to help me find the answer.

Would this task have been suitable to meet the learning goal your group decided on?

Or, would you have modified it? How? **(Answers will vary)**

**BLM 2.10**

**Posing Powerful Questions**

**Lesson Title : Table Problem Grade/Program: 5-8**

|  |
| --- |
| **Goals(s) for a Specific Lesson**  *Use the stem “Students will:”* |
| **Curriculum Expectations**  *Highlight parts to be addressed in the lesson (may not be all parts)* |
| **Big Idea(s) Addressed by the Expectations** |